

Editorial corner – a personal view

Smart polymers for biomedical application and environmental protection

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In the recent years, the environmental responsive polymers have become of major interest as novel intelligent or smart materials. Many kinds of such gels have been developed and studied in regard to the application to several biomedical and industrial fields, e.g. controlled drug delivery systems, muscle-like soft linear actuators, biomimetic energy transducing devices and separation technique.

The combination of polymers with nano-, or micron sized magnetic particles displays novel and often enhanced properties compared to the traditional materials. Synthesis of stimuli-responsive polymer gel microspheres has been receiving growing attention in the past decade. Polymer microspheres that combine both temperature- and pH-responsive volume phase transitions were developed. Due to their relatively rapid and easy magnetic separation, the magnetic microspheres could be widely used in biomedical and bioengineering, such as enzyme immobilization and immunoassay, cell separation, and clinical diagnosis. In addition owing to their sensitivities to both magnetic field and temperature, thermosensitive polymer magnetic microspheres offer a high potential application in the design of a targeting drug delivery system. The utilization of microspheres is considered as a safe and effective way for tissue-specific release of drugs, with a small amount of magnetic thermoresponsive polymer microspheres, a large amount of drug could be easily administered and transported to the site of choice.

Driving forces for international efforts in the field of wastewater treatment technologies are the recognition of environmental problems in surface waters (oxygen depletion, eutrophication, etc.). The development of environmental sensitive polymers gives a great opportunity to fabricate artificial floc structure according to the technological requirements. The smart polymer microspheres with controllable porosity and properties would provide adequate surface for the bacteria to colonize and grow in a controlled environment of microscopic dimensions. Moreover, the constructed artificial flocs are able to respond to the environmental changes, such as temperature and pH alterations. Simple environmental factors could trigger the changes in the shape and size of the artificial floc (i.e., reacting by swelling or shrinking). Hence the microspheres could regulate the availability of electron acceptors and donors by controlling the diffusion kinetics.



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